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Electrical Switch for Vehicle Lighting

Technical Field

The present invention relates to an electrical switch for vehicle lighting, having an operating part that is mounted in a switch housing so as to be rotatable as well as axially movable.

Background of the Invention

With conventional electrical turn/pull switches for vehicle lighting, for example, the parking lights and the low beams can be activated by turning a turn/pull switch in successive steps, and the front and rear fog lights are activated by successive stepped movements in an axial direction. The electrical connections for the rotational and for the axial switching functions are established by means of two different switching devices, for example, by a contact slider in the rotational switch function and by additional micro-switches in the axial switch functions.

Brief Summary of the Invention

The invention provides an electrical turn/pull switch that can be economically manufactured and assembled.

According to the invention, an electrical turn/pull switch is provided for controlling operation of lighting in a vehicle. The switch has a switch housing, an actuating member mounted for rotation about a central axis and for axial movement within the switch housing, and a movable contact carrier coupled to the actuating member for joint rotation and relative axial movement. A fixed contact carrier is mounted in the switch housing in a position axially opposite to the movable contact carrier. A first set of movable contacts are mounted on the

movable contact carrier and associated with a first set of fixed contacts of the fixed contact carrier. A second set of movable contacts are mounted on the movable contact carrier and associated with a set of radially fixed contacts also mounted on the movable contact carrier in positions radially opposite to corresponding ones of the movable contacts of the second set. At least one cam is provided on the actuating member. The cam is movable axially between a first position disengaged from a corresponding movable contact of the second set and a second position engaged with the movable contact of the second set to deflect the contact radially against a corresponding contact of the set of radially fixed contacts. Since the contact elements integrated on the contact carrier are involved in both switch functions, otational and axia, it is possible to dispense with the higher expenditures for the production or purchase and assembly of micro-switches that are additionally needed in conventional turn/pull switches for the axial switch function.

Brief Description of the Drawings

Additional features and advantages of the invention ensue from the following description of a preferred embodiment and from the appended drawings, to which reference is made. The drawings show the following:

Figure 1 – a perspective view of an electrical turn/pull switch according to the invention in a preferred embodiment;

Figure 2 – a perspective view of a contact carrier with contact elements of the turn/pull switch according to the invention of Figure 1;

Figure 3 – a perspective view of the contact elements of Figure 2 and a printed circuit board on which contact paths that interact with the contact elements are laid out.

Detailed Description of the Preferred Embodiments

The electrical turn/pull switch **10** shown in Figure 1 has a generally cylindrical switch housing **12** and, as a manual operating member, a turn/pull button **14**. The turn/pull button **14** is coupled to an actuating member referred to as a switching cross **16** (see Figure 2) that is provided with axially extending actuation ramps **18**. The contact elements for the rotational switch function and for the axial switch function are integrated on a shared contact carrier plate **20**. They are preferably formed by being punched out of a shared plate, for example, from a gold-plated metal strip. Particular punched-out contact elements or areas are subsequently bent as needed. Thus, a contact element **22** corresponds to the contact element for the rotational switch function and the contact elements **24**, **26** correspond to the contact elements for the axial switch function. The contact element **22** is punched out in such a way that a first and second contact pair **22a**, **22b** as well as a first and second contact tag **34**, **36** are formed. Contact elements **24**, **26** each have a contact tag **24a** and **26a** respectively and a contact pair **24b** and **26b** respectively with contact surfaces **24c** and **26c** respectively. The contact elements **24**, **26** of the turn switch function are punched out and bent in such a way that they make no contact with the contact element **22** of the turn switch function. The contact elements **22**, **24** and **26** are attached onto the contact carrier plate **20**, for example, by means of ultrasound welding. Preferably, the contact elements **22**, **24** and **26** are pre-punched out of the gold-plated metal strip before being attached to the contact carrier plate **20** and bent in specific areas and, after attachment to the contact carrier plate **20**, are punched free as needed for the envisaged function.

Relative to Figure 2, above the contact carrier plate **20**, there is a printed contact board **28** shown in Figure 3 with fixed contact elements that are configured as sliding paths **30** that are electrically insulated from each other. The individual sliding paths **30** are each electrically connected with associated contacts of a plug **32**. In the assembled state, the contact carrier plate **20** and the printed circuit board **28** are arranged in such a way with respect to each other that the contact pairs **24**, **26** on their contact surfaces **24c**, **26c**, as well as the contact

pairs **22a**, **22b** touch the printed circuit board **28**. As can be seen in Figure 3, the contact element **22** is bent in particular areas, upwards relative to Figure 3, so that the contact element **22** in this area does not make contact with the contact carrier plate **20**.

When the turn/pull button **14** is rotated, the contact carrier plate **20**, together with the contact elements **22**, **24** and **26** that are attached to it, moves relative to the printed circuit board **28**. As a result, the contact pairs **22a**, **22b** of the turn switch function, which are in contact with the printed circuit board, as well as the contact surfaces **24c**, **26c** of the contact pairs **24b**, **26b** of the axial switch function, slide on the printed circuit board. Depending on the rotational position of the turn/pull switch, either the contact pair **22a** or the contact pair **22b** can be in contact with one of the sliding paths **30** of the printed circuit board **28**. In this way, the contact pairs **22a**, **22b** create a conductive connection between the sliding paths that are correspondingly contacted by the contact pairs **22a**, **22b**. Depending on which of the sliding paths **30** are bridged, the various types of vehicle lighting that can be operated by means of the turn switch function are then activated.

The ramps 18 on actuating member 16 are axially shifted with respect to each other to provide distinct axial switching functions according to the axial position of button 14. In a normal non-activated condition of the axial switches he ramps 18 are disengaged from the associated movable contacts, i.e. contact tags **24a** and **26a**.

When button 14 is pulled to a first axial switch position, i.e. in an upward direction in Figure 1, the ramps **18** on the switching cross **16** interact with the contact tag **24a** to radidally deflect tag **24a** against the opposite radially fixed contact tag **34**, which is bent upwards relative to Figure 2, and which is formed on the contact element **22**. When button 14 is pulled to a second axial position, the contact tag **26a** is additionally deflected against the opposite radially fixed contact tag **36**, upwards relative to Figure 2, which is also formed on the contact element **22**. (The ramp needed for this cannot be seen in Figure 2 since it is located under-

neath the contact carrier plate **20** relative to Figure 2.) Moreover, the contact elements **24**, **26** on the contact surfaces **24c**, **26c** of the contact pairs **24b**, **26b** are each in contact with one of the sliding paths of the printed circuit board **28**, so that an electrical connection between the contact element **22** and the individual contacted sliding path is established. In this fashion, depending on the axial position of the turn/pull switch, various vehicle lighting functions can be controlled.

The contact surfaces of the individual contact elements **22**, **24** and **26** of the contact carrier plate **20**, which interact with the sliding paths **30** of the printed circuit board **28**, are each configured as pairs so that, even if one of the two contact surfaces gets inefficient due to penetration of extraneous matter, the function of the contact elements is still ensured.

Since, in contrast to the turn/pull switches known from the state of the art, the axial switch function as well as the turn switch function are effectuated via contact elements located on a contact carrier plate without a need for additional individual components such as, for example, micro-switches, the invention provides a turn/pull switch that is inexpensive to manufacture and to assemble.

The various switching positions of the turn switch function can be associated, for example, with the parking light and the low beams of a vehicle. The two switching positions of the axial switch function can then be associated, for instance, with the fog headlights and the rear fog light.